

## Appendix E

# Emissions of Energy-Related Carbon Dioxide in the United States, 1949-2000

## Overview

This appendix presents estimates of U.S. carbon dioxide emissions for the period 1949-2000. The data were developed originally at the request of the President's Council of Economic Advisors, for inclusion in a graphic that appeared in the 1997 *Economic Report of the President*.<sup>1</sup> U.S. energy data have undergone a number of shifts over the years, and the estimates can be divided into three periods:

- **1980-2000.** The emissions estimates for this period were developed using the methods and sources described in this report. For 1980 through 1997, the energy data on which the emissions estimates are based come from the Energy Information Administration (EIA) data series published in the *State Energy Data Report*.<sup>2</sup> Estimates for 1998 through 2000, are based on energy data from EIA's *Monthly Energy Review*.
- **1960-1979.** Before 1980, EIA did not maintain a detailed accounting of carbon sequestration due to nonfuel use of fossil fuels. Hence, the data for industrial sector petroleum use, particularly in the category "other petroleum," are not as reliable as those for subsequent years. EIA has also not attempted to develop annual emissions coefficients for fuels in use before 1980, and the estimates do not reflect any changes in fuel quality. The energy data for this period are also drawn from the database of the *State Energy Data Report*.
- **1949-1959.** EIA has made no attempt to distinguish between residential and commercial energy consumption for historical data earlier than 1960. To provide consistent estimates for this appendix, the combined data for residential and commercial energy consumption have been prorated by fuel according to the ratio of consumption in 1960. Composite sectoral petroleum emissions factors are used for this period, based on 1960-weighted petroleum products emissions. The energy data for this period are drawn from the *Annual Energy Review*.<sup>3</sup>

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<sup>1</sup> Council of Economic Advisors, *Economic Report of the President* (Washington DC, February 1998), p. 167.

<sup>2</sup> Energy Information Administration, *State Energy Data Report 1997*, DOE/EIA-0214(97) (Washington, DC, September 1999), pp. 21-26, web site [www.eia.doe.gov/emeu/sep/states.html](http://www.eia.doe.gov/emeu/sep/states.html).

<sup>3</sup> Energy Information Administration, *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), pp. 37, web site [www.eia.doe.gov/emeu/aer/contents.html](http://www.eia.doe.gov/emeu/aer/contents.html).

**Table E1. Energy-Related Carbon Dioxide Emissions from the Residential and Commercial Sectors by Fuel Type, 1949-2000**  
(Million Metric Tons of Carbon)

Year	Residential					Commercial				
	Natural Gas	Petroleum	Coal	Electricity	Total	Natural Gas	Petroleum	Coal	Electricity	Total
1949	15.1	23.2	30.2	19.0	87.4	5.0	13.2	42.2	15.0	75.3
1950	17.8	27.6	29.9	20.2	95.4	5.9	15.7	41.7	15.9	79.2
1951	21.8	30.1	26.4	22.5	100.8	7.2	17.1	36.8	17.8	78.8
1952	23.9	30.8	24.0	24.0	102.8	7.9	17.5	33.5	19.0	77.9
1953	24.8	31.3	20.6	26.2	103.0	8.2	17.8	28.8	20.7	75.4
1954	27.8	33.5	17.9	27.5	106.7	9.2	19.0	25.0	21.7	74.9
1955	30.9	36.0	17.8	30.0	114.7	10.2	20.4	24.9	23.7	79.2
1956	34.1	37.6	16.6	32.4	120.7	11.2	21.3	23.1	25.6	81.3
1957	36.7	36.5	12.7	34.7	120.7	12.1	20.7	17.7	27.4	78.0
1958	40.2	39.1	12.4	35.3	127.0	13.2	22.2	17.3	27.9	80.6
1959	43.5	39.9	10.6	39.1	133.1	14.3	22.6	14.8	30.9	82.6
1960	46.2	43.8	10.6	42.3	142.9	15.2	24.9	14.5	33.4	88.0
1961	48.4	45.1	9.6	44.4	147.5	16.0	25.3	13.2	34.6	89.2
1962	51.8	47.1	9.2	47.4	155.5	18.0	25.9	13.0	37.0	93.9
1963	53.2	47.4	8.0	51.9	160.5	18.7	25.5	11.1	41.7	97.0
1964	56.1	45.7	7.1	55.9	164.9	20.3	25.2	9.5	44.5	99.6
1965	57.9	47.8	6.6	60.2	172.5	21.4	28.1	9.0	47.9	106.4
1966	61.3	47.5	6.3	66.6	181.7	24.0	29.1	9.1	52.9	115.1
1967	63.9	49.2	5.4	69.8	188.4	29.0	30.1	7.8	55.7	122.6
1968	65.9	51.6	4.9	79.0	201.5	30.7	30.6	7.0	61.7	130.0
1969	70.0	52.5	4.6	87.1	214.2	33.3	30.7	6.6	66.4	137.0
1970	71.3	52.8	4.0	95.9	224.0	35.3	31.4	5.5	72.5	144.7
1971	73.3	53.3	3.7	100.8	231.1	37.0	30.5	5.2	76.3	149.0
1972	75.7	55.5	2.9	109.0	243.1	38.5	30.9	4.0	83.6	156.9
1973	72.0	54.2	2.7	117.5	246.4	38.3	31.6	3.8	90.3	164.0
1974	70.5	49.4	2.7	114.6	237.1	37.6	28.7	3.8	87.2	157.4
1975	72.3	47.9	2.2	113.1	235.5	36.8	26.3	3.1	90.1	156.3
1976	74.1	52.3	2.1	119.4	247.9	39.1	29.4	3.0	96.8	168.4
1977	70.8	51.8	2.2	129.0	253.7	36.7	30.4	3.1	102.8	173.0
1978	71.8	50.4	2.2	130.8	255.2	38.0	29.1	3.3	103.2	173.6
1979	72.7	40.8	1.9	134.1	249.5	40.8	26.9	2.9	106.7	177.3
1980	69.9	33.6	1.6	142.9	247.9	38.4	26.1	2.3	111.3	178.0
1981	67.0	29.6	1.8	141.0	239.4	37.1	22.0	2.5	116.3	177.9
1982	68.4	27.6	1.9	139.9	237.9	38.5	20.3	2.9	116.7	178.4
1983	65.0	25.9	1.9	143.4	236.3	36.1	22.5	3.0	118.6	180.1
1984	67.5	25.6	2.1	146.5	241.6	37.3	23.8	3.2	124.7	189.2
1985	65.7	28.4	1.8	149.5	245.4	36.0	20.6	2.7	129.8	189.3
1986	63.8	27.9	1.8	150.7	244.2	34.3	21.9	2.7	131.6	190.6
1987	63.9	28.8	1.7	157.1	251.5	36.0	21.5	2.6	137.6	197.6
1988	68.5	29.9	1.7	164.4	264.5	39.5	20.7	2.6	144.5	207.3
1989	70.9	29.7	1.5	166.3	268.4	40.3	19.2	2.3	149.1	210.8
1990	65.1	24.0	1.6	166.4	257.0	38.8	18.0	2.4	151.0	210.3
1991	67.5	24.5	1.4	168.2	261.6	40.4	17.1	2.2	150.7	210.4
1992	69.4	24.9	1.5	166.0	261.8	41.5	16.1	2.2	150.9	210.8
1993	73.4	26.3	1.5	177.2	278.4	42.4	14.9	2.2	157.7	217.2
1994	71.7	25.4	1.4	177.3	275.8	42.9	14.9	2.1	160.5	220.4
1995	71.8	25.8	1.4	178.9	277.9	44.9	14.1	2.1	163.5	224.6
1996	77.6	27.6	1.4	187.3	293.9	46.8	14.6	2.1	169.5	233.1
1997	73.8	27.1	1.5	190.4	292.8	47.7	13.9	2.2	181.5	245.4
1998	67.2	25.0	1.1	200.4	293.7	44.6	13.0	1.7	191.1	250.4
1999	69.9	27.3	1.2	200.3	298.8	45.1	13.1	1.8	193.1	253.1
P2000	73.2	27.5	1.2	211.5	313.4	49.3	14.2	1.8	202.5	267.8

Note: P = Preliminary

Sources: 1998-2000 Estimates documented in this report, based on energy data in the *Monthly Energy Review*.  
1980-1997 Estimates documented in this report, based on energy data in the *State Energy Data Report*.  
1960-1979 Calculated from energy data in the *State Energy Data Report*.  
1949-1959 Calculated from energy data in the *Annual Energy Review*.

**Table E2. Energy-Related Carbon Dioxide Emissions from the Industrial and Transportation Sectors, by Fuel Type, 1949-2000**

(Million Metric Tons of Carbon)

Year	Industrial					Transportation				
	Natural Gas	Petroleum	Coal	Electricity	Total	Natural Gas	Petroleum	Coal	Electricity	Total
1949	45.9	57.7	131.6	33.1	268.4	1.9	119.1	42.9	0.5	164.5
1950	51.1	66.0	140.2	38.4	295.7	2.8	129.7	38.9	0.6	172.0
1951	58.3	70.5	149.9	42.6	321.2	3.1	142.7	34.2	0.6	180.6
1952	60.2	71.6	133.5	43.7	309.0	3.4	149.1	24.5	0.6	177.6
1953	61.9	73.5	143.6	49.1	328.1	3.4	156.1	18.2	0.6	178.4
1954	62.2	75.1	114.5	48.5	300.3	3.7	157.8	11.5	0.6	173.6
1955	67.7	82.9	136.0	60.5	347.0	4.5	169.9	10.5	0.7	185.5
1956	70.1	85.1	137.1	65.3	357.7	4.5	176.4	8.5	0.7	190.0
1957	73.6	84.0	133.8	65.4	356.8	4.6	179.8	6.0	0.7	191.2
1958	75.0	85.8	109.7	61.3	331.8	5.2	183.3	2.9	0.7	192.1
1959	81.3	90.3	106.8	67.4	346.0	5.2	190.6	2.2	0.8	198.7
1960	86.0	89.5	110.2	68.1	353.8	5.2	195.5	1.9	0.7	203.2
1961	86.9	89.1	105.3	69.7	350.9	5.6	199.3	0.5	0.7	206.1
1962	90.8	92.0	106.4	73.2	362.4	5.7	207.9	0.4	0.7	214.7
1963	95.2	93.5	111.3	78.1	378.2	6.3	215.5	0.4	0.6	222.8
1964	100.3	98.6	119.1	83.4	401.4	6.5	221.9	0.4	0.6	229.4
1965	103.5	102.1	124.0	88.8	418.3	7.5	228.9	0.4	0.6	237.3
1966	110.0	105.6	125.9	97.4	438.8	8.0	241.1	0.4	0.6	250.0
1967	113.6	105.5	119.4	99.6	438.0	8.5	253.1	0.3	0.6	262.5
1968	121.4	107.2	117.5	107.9	454.0	8.8	274.2	0.3	0.5	283.7
1969	129.8	111.3	113.4	114.1	468.6	9.3	285.7	0.2	0.5	295.8
1970	133.7	111.1	111.5	117.4	473.6	10.7	295.2	0.2	0.5	306.6
1971	138.7	111.3	94.8	119.0	463.8	11.0	307.0	0.1	0.5	318.6
1972	139.1	121.4	96.0	129.8	486.3	11.3	325.5	0.1	0.5	337.4
1973	147.2	128.4	97.7	139.2	512.5	10.7	343.8	0.1	0.5	355.1
1974	141.1	121.2	94.7	135.7	492.7	9.8	335.5	0.0	0.5	345.9
1975	120.7	114.6	88.9	132.3	456.4	8.6	339.6	0.0	0.6	348.8
1976	124.0	127.0	88.2	148.5	487.6	8.0	356.9	0.0	0.6	365.6
1977	122.3	137.8	83.7	157.2	501.0	7.8	371.3	0.0	0.6	379.7
1978	121.2	135.9	83.1	157.0	497.1	7.8	386.8	0.0	0.5	395.1
1979	120.9	143.6	88.3	165.4	518.1	8.8	383.2	0.0	0.6	392.7
1980	118.4	128.2	75.4	162.3	484.2	9.4	368.1	0.0	0.6	378.1
1981	116.3	110.0	75.8	161.2	463.3	9.5	364.0	0.0	0.6	374.1
1982	100.1	104.0	61.2	142.9	408.2	8.8	356.1	0.0	0.6	365.6
1983	95.2	96.0	60.2	148.2	399.6	7.3	359.0	0.0	0.6	366.9
1984	104.1	105.8	69.3	157.3	436.5	7.8	370.5	0.0	0.7	379.0
1985	98.9	99.9	67.8	157.6	424.1	7.5	376.0	0.0	0.7	384.3
1986	93.1	101.8	64.7	152.8	412.5	7.2	391.0	0.0	0.7	399.0
1987	101.8	101.4	66.1	158.6	427.9	7.7	402.5	0.0	0.7	411.0
1988	106.9	104.8	71.1	165.1	447.9	9.1	417.5	0.0	0.7	427.3
1989	112.8	98.9	69.4	170.0	451.1	9.4	422.4	0.0	0.7	432.5
1990	101.2	98.9	63.4	189.0	452.7	9.8	421.2	0.0	0.7	431.8
1991	101.0	93.1	59.3	186.2	439.8	9.0	414.6	0.0	0.7	424.2
1992	102.7	101.2	56.1	194.2	455.1	8.8	421.6	0.0	0.7	431.1
1993	105.5	94.4	55.6	196.6	452.9	9.3	426.4	0.0	0.7	436.4
1994	106.6	97.5	55.8	201.9	463.3	10.2	438.2	0.0	0.9	449.3
1995	111.9	92.3	55.9	199.4	461.1	10.4	446.5	0.0	0.8	457.8
1996	116.5	100.1	54.2	204.6	476.1	10.6	457.4	0.0	0.8	468.9
1997	115.0	100.8	54.5	210.1	481.5	11.3	461.5	0.0	0.8	473.6
1998	106.5	96.2	50.4	214.7	469.5	9.5	471.2	0.0	0.9	481.5
1999	104.7	91.8	49.6	218.2	465.8	11.0	487.6	0.0	0.9	499.4
P2000	104.0	87.6	45.7	226.7	465.7	11.4	502.5	0.0	0.9	514.8

Note: P= Preliminary

Sources: 1998-2000 Estimates documented in this report, based on energy data in the Monthly Energy Review.  
 1980-1997 Estimates documented in this report, based on energy data in the State Energy Data Report.  
 1960-1979 Calculated from energy data in the State Energy Data Report.  
 1949-1959 Calculated from energy data in the Annual Energy Review.

**Table E3. Total Energy-Related Carbon Dioxide Emissions by End-Use Sector and the Electric Power Sector by Fuel Type, 1949-2000,**  
(Million Metric Tons of Carbon)

Year	End-Use Sector					Electric Power Sector			
	Residential	Commercial	Industrial	Transportation	Total	Natural Gas	Petroleum	Coal	Total
1949	87.4	75.3	268.4	164.5	595.6	8.2	8.7	50.7	67.6
1950	95.4	79.2	295.7	172.0	642.2	9.4	10.0	55.7	75.1
1951	100.8	78.8	321.2	180.6	681.5	11.4	8.5	63.6	83.5
1952	102.8	77.9	309.0	177.6	667.3	13.5	8.9	64.9	87.3
1953	103.0	75.4	328.1	178.4	684.9	15.4	10.8	70.4	96.7
1954	106.7	74.9	300.3	173.6	655.6	17.4	8.9	72.0	98.3
1955	114.7	79.2	347.0	185.5	726.3	17.1	10.0	87.7	114.8
1956	120.7	81.3	357.7	190.0	749.7	18.4	9.5	96.0	124.0
1957	120.7	78.0	356.8	191.2	746.6	19.9	10.6	97.8	128.3
1958	127.0	80.6	331.8	192.1	731.4	20.4	10.4	94.3	125.1
1959	133.1	82.6	346.0	198.7	760.3	24.3	11.7	102.1	138.1
1960	142.9	88.0	353.8	203.2	787.9	25.7	11.7	107.1	144.5
1961	147.5	89.2	350.9	206.1	793.7	27.2	11.8	110.3	149.4
1962	155.5	93.9	362.4	214.7	826.6	29.3	11.9	117.1	158.3
1963	160.5	97.0	378.2	222.8	858.6	32.0	12.4	127.9	172.3
1964	164.9	99.6	401.4	229.4	895.2	34.7	13.4	136.3	184.4
1965	172.5	106.4	418.3	237.3	934.5	34.7	15.3	147.5	197.4
1966	181.7	115.1	438.8	250.0	985.7	39.1	18.7	159.6	217.4
1967	188.4	122.6	438.0	262.5	1011.5	41.1	21.4	163.2	225.7
1968	201.5	130.0	454.0	283.7	1069.2	47.0	25.0	177.1	249.2
1969	214.2	137.0	468.6	295.8	1115.6	52.0	33.3	182.8	268.1
1970	224.0	144.7	473.6	306.6	1149.0	58.3	45.0	183.0	286.3
1971	231.1	149.0	463.8	318.6	1162.5	58.9	52.9	184.8	296.6
1972	243.1	156.9	486.3	337.4	1223.7	58.8	65.5	198.6	322.9
1973	246.4	164.0	512.5	355.1	1277.9	53.8	74.4	219.3	347.5
1974	237.1	157.4	492.7	345.9	1233.1	50.6	71.2	216.2	338.0
1975	235.5	156.3	456.4	348.8	1197.0	46.5	67.0	222.6	336.1
1976	247.9	168.4	487.6	365.6	1269.5	45.4	73.6	246.4	365.4
1977	253.7	173.0	501.0	379.7	1307.4	47.3	82.6	259.8	389.6
1978	255.2	173.6	497.1	395.1	1320.9	47.4	84.5	259.6	391.5
1979	249.5	177.3	518.1	392.7	1337.7	51.9	69.6	285.3	406.9
1980	247.9	178.0	484.2	378.1	1288.2	54.8	55.3	306.9	417.0
1981	239.4	177.9	463.3	374.1	1254.7	54.1	46.3	318.7	419.1
1982	237.9	178.4	408.2	365.6	1190.1	48.0	33.0	319.1	400.1
1983	236.3	180.1	399.6	366.9	1182.9	43.1	32.5	335.3	410.9
1984	241.6	189.2	436.5	379.0	1246.3	46.3	27.0	355.7	429.1
1985	245.4	189.3	424.1	384.3	1243.0	45.5	22.9	369.2	437.6
1986	244.2	190.6	412.5	399.0	1246.2	38.7	30.6	366.5	435.9
1987	251.5	197.6	427.9	411.0	1287.9	42.2	26.4	385.2	454.0
1988	264.5	207.3	447.9	427.3	1347.0	39.0	32.9	402.8	474.7
1989	268.4	210.8	451.1	432.5	1362.8	41.2	35.4	409.4	486.1
1990	257.0	210.3	452.7	431.8	1351.6	58.3	28.2	420.4	507.0
1991	261.6	210.4	439.8	424.2	1336.2	60.3	26.8	418.8	506.0
1992	261.8	210.8	455.1	431.1	1359.0	63.9	22.8	425.3	512.0
1993	278.4	217.2	452.9	436.4	1385.1	64.9	25.6	441.9	532.4
1994	275.8	220.4	463.3	449.3	1408.9	70.2	24.1	446.3	540.7
1995	277.9	224.6	461.1	457.8	1421.1	75.5	17.6	449.4	542.5
1996	293.9	233.1	476.1	468.9	1471.7	68.9	18.9	474.3	562.1
1997	292.8	245.4	481.5	473.6	1493.4	73.7	21.4	487.9	583.1
1998	293.7	250.4	469.5	481.5	1495.4	82.6	29.0	495.5	607.2
1999	298.8	253.1	465.8	499.4	1517.2	84.7	29.4	498.6	612.6
P2000	313.4	267.8	465.7	514.8	1561.7	93.2	26.0	522.4	641.6

Notes: Emissions from the electric power sector are apportioned to each end-use sector according to their share of electricity sales.  
P = Preliminary.

Sources: 1998-2000 Estimates documented in this report, based on energy data in the Monthly Energy Review.  
1980-1997 Estimates documented in this report, based on energy data in the State Energy Data Report.  
1960-1979 Calculated from energy data in the State Energy Data Report.  
1949-1959 Calculated from energy data in the Annual Energy Review.